

**Plan to Meet Requirements of Term 15 -  
State Water Resources Control Board Order WR 2007-0022**



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## **1.0 Introduction and Background**

This plan has been prepared by the Sonoma County Water Agency (Agency) to fulfill the requirements of Term 15 of the State Water Resources Control Board (SWRCB) Order WR 2007-0022.

The Agency operates six collector wells and seven vertical wells adjacent to the Russian River in the vicinity of the Mirabel and Wohler areas in western Sonoma County. These facilities provide a peak month, average day capacity of approximately 92 million gallons per day. Collector Nos. 1, 2, and 6 are located in the Wohler area and Collector Nos. 3, 4, and 5, and the seven vertical wells, are located in the Mirabel area. To increase production capacity during periods of peak demand, generally from mid-spring through late fall, the Agency raises an inflatable dam at Mirabel. The dam is 45 meters wide, 4 meters high, and was designed to be inflated with water. Water that pools behind the dam is diverted into infiltration ponds to recharge the aquifer near Collector Nos. 3, 4, and 5. In addition, the inflatable dam increases the stage of the river and the area of infiltration behind the dam, thus increasing groundwater levels and production capacity of the collector wells in the Wohler area. Studies conducted prior to construction of Collector No. 6 indicate that by operating the inflatable dam, the production capacity of the Russian River facilities was approximately doubled.

From 2000 to 2004, Agency fisheries biologists conducted a number of investigations to evaluate downstream juvenile fish passage at the Mirabel inflatable dam and the backwater it creates. Downstream fish migration generally occurs from February through June. Migrating fish can select three potential routes to pass the dam: (1) fish ladders intended for upstream migrating adult fish; (2) bypass pipes associated with fish screens; and (3) the dam crest. By tracking approximately 500 steelhead implanted with uniquely coded radio transmitters, Agency biologists determined that low velocity in the fore bay above the dam and shallow depth over the dam crest impeded passage. A network of underwater and aerial radio telemetry antennas at the dam site also indicated that more than 80 percent of the fish passed over the dam crest as opposed to through the ladders or bypass pipes.

To determine if increased depth and velocity at the dam crest would accelerate fish passage, a study was conducted by deforming the dam into a notched configuration. The notch was created by releasing a portion of the water from the dam bladder and pumping compressed air into either side of the structure to replace the water. The notched configuration significantly increased crest depth and velocity compared to the normal fully inflated condition. Fish moved significantly faster through the fore bay when the dam crest was notched

(median residence time 2.4 hours, mean 12.8 hours) than when the dam was fully inflated (median 6.3 hours, mean 20.3 hours).

The Agency also studied the hydraulics in the dam fore bay using a variety of sensitive instruments. A pressure sensor located in the dam notch, a water level recorder in the fore bay near the fish screens, and the USGS Hacienda Bridge gauging station below the dam recorded diurnal changes in spill depth and flow. This daily fluctuation was due to the expansion and contraction of the air-filled shoulders of the dam bladder. As air temperature increased during the mid-morning, and conversely cooled in the evening, the dam bladder would rise and fall, changing the cross-sectional area of the notch. Most daily depth changes were approximately 24 centimeters. The timing of these diurnal fluctuations was advantageous for fish passage because the period of maximum depth, and hence greatest velocity through the notch, occurred during nighttime hours. Downstream migrating juvenile salmonids predominantly emigrate during darkness to minimize predation risk.

During normal spring flow conditions, diurnal expansion and contraction of the dam does not generally result in perceptible flow changes downstream. Furthermore, the notch is only present in the dam for two to three months during its operation. Based on minimum flows identified in SWRCB Order WR 2007-0022, river flows in the vicinity of the Mirabel dam are approximately 50 percent lower than spring flows under "Normal" water supply conditions. Consequently, flow changes resulting from diurnal fluctuations in the dam height appeared more significant this year.

## **2.0 Short-Term Actions**

On June 28, 2007, the Agency removed the notch in the inflatable dam by displacing air that had been pumped into the dam with water. Removal of the notch corresponded to the end of downstream migration of juvenile salmonids. By removing air from the dam that created the notch, diurnal fluctuations in the inflatable dam height have been significantly reduced. Consequently, perceptible diurnal flow changes downstream of and due to the operation of the inflatable dam are not anticipated to occur for the remainder of the term of SWRCB Order WR 2007-0022.

### **3.0 Proposed Long-Term Actions**

The Agency is currently working with engineers at Bridgestone, the manufacturer of the inflatable dam, regarding an engineered solution to minimize downstream flow changes resulting from diurnal fluctuations in the dam height. The Agency hopes that a feasible solution can be determined by the end of 2007. If a feasible solution is identified, the Agency will design the solution and prepare for implementation in the summer of 2008. Assuming all necessary permits and clearances can be obtained prior to the summer of 2008, the solution should be in place prior to inflation of the dam in 2009.